BULLETIN

OF THE

Society for the Promotion of Engineering Education

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EDITORIALS.

Staff Supervision and Grading of Instructors.—Dean Goss and Professor Karapetoff have taken up one of the most difficult subjects in technical education, the proper mating of men and tasks. The supervising faculty is largely a matter of personality. It takes a big man to manage men efficiently and comfortably for all concerned. There is no more admirable organization than a compact, congenial and efficient faculty. Such cannot be produced by system, although system is necessary. It must be produced by perfect understanding and perfect confidence. The suggestion of careful char-

acter analysis made by Professor Karapetoff fits in well with Dean Goss's outline of the ideal faculty organization in a technical school.

Educational Efficiency.—Mr. Hale makes an arraignment of our educational system in that it does not bring the work-aday atmosphere of business into the schools, and further, that it does not begin by interesting the pupil in the things of ordinary life. His main contention is that habits are fostered by school life which are not conducive to success in after-life. Mr. Hale is a practical consulting engineer whose observation has given him radical ideas regarding what the schools ought to do. His contentions will be assented to by many teachers even if they do not know how to carry out needed methods of reform. Professor Springer, in this issue of the BULLETIN, continues his series of articles on fundamental facts in education. He takes up, one by one, the factors which make up the life of child and adult and endeavors to show how these are related to the problems of education. These are mainly psychological matters but they are of interest in that they get at the root of the educational problem.

The Correct Use of English.—Once more the attention of the members of the Society is drawn to the matter of English, this time by the list of faulty expressions which President Alderson has collected and tabulated for the use of his students. There is a marked wave of interest in technical writing and the attention of students cannot be drawn too forcibly to the subject. Even without formal courses in English, much can be done by employing reports and papers of various kinds as incidental exercises in composition. A convenient list of avoidable faults should be of use to teacher and student.

NEW MEMBERS.

On the last letter ballot, in addition to the names listed on p. 191 of the December BULLETIN, the following were elected to membership. Their titles and addresses are printed in the January BULLETIN. Messrs. E. S. Barney, W. G. Catlin,

Hardy Cross, H. S. Dickerson, W. P. Graham, O. C. Lester, W. R. McCann, C. C. May, F. A. Randall, A. T. Robinson, H. J. Spooner, F. G. Tappan, E. B. Thurston, L. E. Vaughan, J. E. Woodman.

APPLICANTS FOR ADMISSION.

CARTER, CHAS. J., Instructor in Machine and Foundry Practice, University of Maine, Orono, Me. 1913

CURTIS, L. F., Instructor in Electrical Engineering, University of Washington, Seattle, Wash. 1913

DYER, F. C., Demonstrator in Mining Engineering, Faculty of Applied Science, University of Toronto, Toronto, Ont., Canada 1913

FLETCHER, A. B., Highway Engineer, Dept. of Engineering, State of California, Sacramento, Calif. 1913

MARKER, J. R., State Highway Commissioner, 707 Hartman Bldg., Columbus, O. 1913

RANSOM, H. U., Instructor in Civil Engineering, Harvard University, Cambridge, Mass. 1913

RAYNER, WM. H., Instructor in Civil Engineering, University of Illinois, Urbana, Ill. 1913

RICHARDSON, CLIFFORD, Consulting Engineer, 30 Church St., New York, N. Y. 1913

ROLLINS, JAS. W., President, Holbrook, Cabot & Rollins Corp., Engineers and Contractors, Boston, Mass. 1913

TAYLOR, WM. E., Professor of Applied Mathematics and Head of Dept., Syracuse University, Syracuse, N. Y. 1913

TREASURER'S MID-YEAR STATEMENT, JAN. 15, 1913. (APPROXIMATE.)

Received to date, for current dues	$2,976.00
Received to date, for back dues	170.00
Received to date, from other sources	1,272.28
	$4,418.28
On hand, June 17, 1912	2,194.01
	$6,612.29
Paid to date	4,434.82
Balance on hand	$2,177.47
Current dues outstanding	$1,464.00
Back dues outstanding	486.04
Due from non-members	234.34
Total	$2,184.38

SOCIETY BUSINESS.

President Magruder has appointed Professor W. E. Mott as a member of the Committee on Instruction in Civil Engineering in place of Mr. G. S. Williams who is unable to serve.

LETTERS TO THE EDITOR.

Très-honoré Collègue: Je vous remercie de tout mon coeur pour le prompte et aimable envoi du SYLLABUS préparé par la S. P. E. E., que je me prépare à examiner avec le soin qu'il mérite. Je ne manquerai d'en rendre compte dans mon BOLLETTINO et je suis certain que la chose interessara beaucoup en Italie, car nous aussi sommes en train de préparer une reforme des études qui préparent les ingénieurs. Je vous prie de vous adresser à moi en toute occasion ou j'aie le bonheur de vous être utile, en usant même liberté dont je vous ai donné l'example.

Votre très-dévoué,

GÊNES, 2 Nov., 1912. D. G. LORIA.

SECRETARY, S. P. E. E.,

Dear Sir: Mr. J. W. Dietz, manager, educational department, Western Electric Co., writes an interesting letter, a copy of which I am sending you as a suggestion for a possible discussion in the BULLETIN, or at the annual meeting. I am taking this up with our Students' Society of Engineers, suggesting that it appoint committees to study various lines of engineering enterprise and if it does not care to take up such a course in the whole field of engineering, I would suggest that the seniors and post seniors make such a survey of the electrical field. For a number of years I have discussed before the electrical classes the various lines of opportunity, and in common with other engineering schools, we have annually a series of visits from representatives of the larger manufacturing and operating corporations. I am suggesting to our Society of Engineers, that the corporation representatives would probably welcome the opportunity to address the entire body of engineering students in addition to their special confer-

ences with the electrical engineers. It might be interesting to have an exchange of reports as to how this matter is treated in the various technical schools.

Yours very truly,

College of Engineering, University of Minnesota. Geo. D. Shepardson.

Professor G. D. Shepardson, University of Minnesota,

Dear Sir: A recent request from a senior for information, to be presented at a seminar class at one of the western colleges, regarding our training courses, has caused me to think considerably about the plan for helping the men get the whole story of various phases of the electrical field before reaching a decision as to the line of work which they will follow. Knowing your personal interest in these matters, I wish to ask your criticism of the following suggestions regarding a plan for a meeting, or a series of meetings, of student engineering societies. Topic:

After Graduation—What?

Collection and Presentation of Data: Have the committee on meetings appoint certain members to investigate various branches of engineering activity and report their findings to the Society. The committee might make the reports comprehensive by suggesting that the investigation cover such points as: money invested in the industry, number of people engaged, possibility of growth of the business, how many graduates of "blank" college have gone into the work, how the new men get started in the business (this question could be discussed directly with representative business organizations in various phases of the industry), are other "blank" college men satisfied with their progress in the work?

The following advantages of the above plan suggest themselves: 1st. The men would be gaining for themselves information which will enable them to make intelligent decisions as to choice of occupation. 2d. It will avoid a great deal of du-

plication of effort. The reports could be filed for reference of all the men. 3d. It would tend to aid in making more definite the information sought from advisers as to questions of personal fitness in certain lines of work. 4th. It would aid underclassmen in their choice of electives and summer occupations. 5th. It would make more comprehensive data available for each man when he is making personal investigation regarding his future work. Perhaps something along the above lines has been tried and found unsatisfactory or some other plans found decidedly more useful. I am not closely enough in touch with these things to know, and would, therefore, appreciate your frank criticism of the plan. Would you think it worth while to suggest it to Professor Norris as a subject for discussion in the BULLETIN of the S. P. E. E.?

Yours truly,

J. W. DIETZ.

EDUCATIONAL DEPARTMENT,
WESTERN ELECTRIC CO.

PERSONAL NOTES.

Arthur H. Blanchard, professor of highway engineering in Columbia University, on November 25 of last year, delivered an address entitled "The Art and Science of Highway Engineering" at the celebration of Founder's Day at the Clarkson Memorial School of Technology.

Professor Harold B. Smith, director of the department of electrical engineering of the Worcester Polytechnic Institute, who is on leave of absence and who has recently returned from a trip around the world, was in Worcester recently and delivered three illustrated lectures descriptive of his travels. The first was before the Alumni Association, the second before the Worcester Polytechnic Institute Branch of the American Institute of Electrical Engineers and the third for members of the electrical engineering department and their friends.

Ellis E. Bankson, formerly assistant professor of civil engineering at the University of Pittsburgh, is now lecturer on

materials and hydraulics at the University of Manitoba, Winnipeg, Canada.

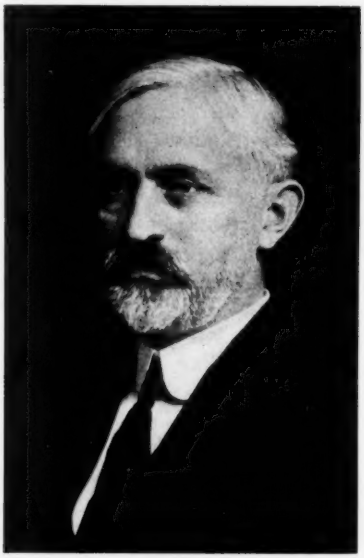
On the evening of December 13, 1912, a dinner was given in honor of Dean W. F. M. Goss, of the College of Engineering, University of Illinois, by local members of the American Society of Mechanical Engineers, members of the faculty of the College of Engineering and members of the Council of Administration of the University. The dinner was given in recognition of the election of Dean Goss to the presidency of the American Society of Mechanical Engineers.

Mr. J. H. Proctor has resigned as instructor in the Agricultural and Mechanical College of Texas, to take up work in the legal department of the Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

Dr. Clyde A. Duniway, A.B., Cornell, Ph.D., Harvard, was inaugurated President of the University of Wyoming at Laramie, on January 24th. President Duniway comes of pioneer stock, being the son of Benjamin Charles and Abigail (Scott) Duniway. His mother, now seventy-eight years old, crossed the plains in a prairie schooner while in her 'teens. She later became a teacher, a writer and a lecturer, enthusiastically supporting "equal rights" in several states in the northwest. She composed the Centennial Ode read at the Lewis and Clark Exposition in 1905, and at that Exposition they celebrated an Abigail Scott Duniway day in her honor.

Her son was sent East to college and won many honors at Cornell. Beside winning the President White scholarship he was speaker of the Cornell Congress, editor-in-chief of the Era, elected to Phi Beta Kappa and earned a place on the Commencement stage. After graduation, Mr. Duniway continued his studies at Harvard from which he received the degree of Ph.D. He was instructor at Harvard and Radcliffe Colleges for one year and then went to Leland Stanford Jr. University as assistant professor of history. From Stanford Professor Duniway was called to the presidency of the University of Montana in 1908, and on leaving there was elected to the presidency of the University of Wyoming.

At his inauguration, one of the special features was an illumination of the campus and the college buildings which



was in charge of the electrical engineering department. This illumination was the first undertaking of the kind to be carried out in the State.

PUBLICATIONS RECEIVED.

Bulletin No. 9 (revised edition), University of Illinois Engineering Experiment Station. An Extension of the Dewey Decimal System of Classification Applied to the Engineering Industries, by L. P. Breckenridge and G. A. Goodenough. After the introduction, which discusses the uses and advantages of the Dewey decimal system, a table of class numbers and a relative index are given. These tables are very detailed as relating to the subject of engineering. 117 pages, 50 cents.

Michigan Section of the National Electric Light Association. An account of the first convention of the Section held on the S. S. Majestic during the convention cruise to 30,000 Islands, Georgian Bay, Canada.

The Johns Hopkins Alumni Magazine, Vol. 1, No. 1. Published in the interest of the university and the alumni. Published four times during the academic year. Subscription price, $1.00. Address the Managing Editor, 106 W. Mulberry St., Baltimore, Md.

Announcement, 1912–1913, of the graduate courses in highway engineering offered at Columbia University, New York, N. Y.

The Iowa Engineer, Vol. XIII, Nos. 1 and 2, containing an article by Dean Marston of Iowa State College, entitled "A System of Industrial Education for Iowa."

Education and Industrial Peace, by Herman Schneider, Dean of the College of Engineering, University of Cincinnati. A reprint from the November, 1912, *Annals* of the American Academy of Political and Social Science.

Pamphlet containing a list of the publications of the Carnegie Institution of Washington, with price of each postpaid. Price lists and descriptive lists will be sent to those interested. Communications should be addressed to The Carnegie Institution of Washington, Washington, D. C.

Minnesota Alumni Weekly, Vol. XII, No. 10. Contains an article signed for the Alumni by James B. Gilman, president, and William T. Ryan, secretary, Engineering Alumni Association, University of Minnesota, expressing their appreciation of the services of Professors Emeritus A. E. Haynes and H. T. Eddy. A biographical sketch of each follows.

Report of the State Roads Commission of Maryland. First, Second, Third, and Fourth Annual Reports, for the years 1908–1911. 184 pages, with numerous photogravures and tables.

Reprint from *The Technology Review,* November, 1912. "Our New Summer Camp," by C. M. Spofford, Professor of Civil Engineering, Boston Institute of Technology. An illustrated account of the Summer School of Civil Engineering at East Machias, Maine.

Economics of Highway Construction, by Clifford Richardson. Reprint from the *Engineering Record* of December 14, 1912. A paper read before the American Road Builders' Association, Cincinnati, O., December 5, 1912. Mr. Richardson deals with various methods of providing for the construction and maintenance of public highways and suggests that a portion of the necessary funds might be obtained by putting a tax on gasoline.

GRADING OF INSTRUCTORS.

BY V. KARAPETOFF,

Professor of Electrical Engineering, Cornell University.

The two forms reprinted below have been recently adopted by the electrical engineering department of Sibley College, for the purpose of recording the personal qualifications of the members of the instructing corps. The first sheet contains the biographical data and the most important qualifications of a teacher; the second sheet gives his character analysis in detail. The ten-point scale used in grading is explained on the second sheet. The grading is done by the head of the department with the assistance of the other professors who are or have been associated with a particular instructor. The record is, of course, considered confidential.

Blank forms are also distributed among the instructors in order that they may know the principal requirements of the department, and may be stimulated to development in character and ability. To stimulate to self-training and introspection through the use of these forms was the principal purpose in introducing them. Besides, they are helpful in distributing the teaching work from term to term, in considering promotions, and in recommending the men to other schools.

The appended forms have been filled with grades referring to one of the men in our department, marked by himself. While the writer thinks that his friend was too modest, and considerably undervalued himself on several points, nevertheless the grading is valuable as a sincere attempt at introspection on the part of a man who is a good teacher and who earnestly strives to become a better one.

The second and the third lines from the bottom on the first sheet require some explanation. Our electrical department comprises sixteen teachers, two full professors, two assistant

professors, and twelve instructors. In order to maintain the proper *esprit de corps* and to direct efficiently the develop-

TABLE I.

Name ..... Date .....

GENERAL INFORMATION.

Born, year ..... Place ..... General health .....
Education and degrees, giving places and dates .....
Practical experience, with details and dates (including summer work)
.....
Teaching experience, in detail .....
.....
Married, yes, no. How many children? .....
Strongest points in character and ability .....
Weakest points in character and ability .....
Best adapted for .....
Left us $\frac{\text{voluntarily}}{\text{not reappointed}}$ (date) to go to .....

	Grade
Knowledge of the fundamentals of electricity and magnetism	10
Mathematical ability	10
Electrical engineering experience	3
Knowledge of the current practice in electrical engineering	5
Non-electrical engineering experience	0
Ability as teacher in the laboratory	6
Ability as teacher in elementary course	—
Ability as teacher in advanced theory	8
Ability as lecturer	7
Ability in recitation and quizzes	7
Ability in personal contact with students	3
Ability as mechanic	5
Ability as writer	7
Ability as practical electrician	4
Ability as mechanical draftsman and designer	6
Ability for original research, experimental	8
Ability for original research, theoretical	8
Administrative ability	2
General culture and education	6
Quality of work in Educational Seminar	5
Quality of work in Theoretical Seminar	8
Interest and enthusiasm in teaching	10

Graded by .....

TABLE II.

Name ..... Date .....

CHARACTER ANALYSIS.

Mental.	Grade	*Emotional.*	Grade
Accuracy	10	Agreeableness	7
Broadmindedness	8	Appearance	6
Business judgment	5	Human nature	4
Common sense	6	Ideality	10
Creative imagination	7	Loyalty	8
Individuality	8	Optimism	10
Practical inclination	4	Personal magnetism	3
Quickness of perception	10	Self forgetfulness in work	10
Reasoning and reflection	8	Sociability	3
Tact	3	Veracity	10
Theoretical inclination	10		
Value of practical experience	6		

Volitional.	
Adaptability	7
Ability for team work	3
Commendable ambition	7
Dependability	10
Energy	9
Firmness	5
Initiative	10
Improvability	7
Persistence	10
Power of concentration	5
Power of expression	7
Regularity (punctuality)	8
Repose	1

Meaning of the Grades.

10	Excellent.
9	Very fine.
8	Fine.
7	Good.
6	Fair.
5	Average.
4	Moderate.
3	Small.
2	Meager.
1	Poor.

REMARKS:

Place for photograph

Graded by .....

ment of the younger members, two seminars are conducted, the attendance at which is required of all the teachers in the department. No graduate students or others are admitted, so

that the discussion is perfectly frank. At one seminar the fundamentals of electrical engineering are studied from an advanced point of view; the other seminar is devoted to discussion of technical education and of its aspects in application to particular needs. The quality of work done at these seminars is considered to be an important factor in judging the fitness of a particular man, and consequently it is marked on his sheet.

COMMENTS ON OUR PRESENT EDUCATIONAL SYSTEM.

BY R. M. HALE,

Consulting Engineer, Seattle, Wash.

Whether our present educational system is top heavy or not, and whether it is best suited to the needs of the great majority of our people, are two of the very important questions demanding solution. There are two classes of boys attending our high schools and colleges. The first and by far the smaller consists of rich men's sons who never had to work for their living, and never expect to do so. They are men who are not dependent on their own efforts for their support. As long as they remain in this class, our present educational system meets all the demands they put upon it, but at any moment their position may be so altered that they fall at once into the second class, men who are dependent upon their own efforts for support. This latter class undoubtedly includes the large majority of our people, and therefore our educational system should aim to supply the needs of these people. Also the majority of the second class are compelled, immediately upon finishing their schooling, to be at once self-supporting. It follows that one of the principal aims of the system should be to provide these boys with an equipment which has an immediate commercial value.

Speaking generally, a man's wages are a fair index of his ability and so we should expect to see the college man in great demand among employers, and at a reasonably good remuneration. As a matter of fact, however, college men apply for any kind of a job and feel equally well fitted for all. This in itself is evidence that they are specially fitted for none. Some of the large manufacturing companies maintain apprenticeship schools in which they educate their own men. The col-

lege man is put through a course as well as the non-college man. The average college graduate generally ends, after some of the conceit is knocked out of him, by accepting a very subordinate position at a wage barely sufficient for support. He has a smattering of knowledge of a number of subjects but not enough of any one to have a commercial value higher than that of the man who labors physically. Mere muscle is a drug on the market but brains are a rare commodity.

Considering all the claims made by our present educational system, we are justified in expecting that they furnish the boy an equipment which will start him off on a higher level than the laborer. Unless the system does this its claims cannot be justified, and those responsible, place themselves in a position of selling a commodity which is not as represented. The common laborer is often such because his brain is atrophied through disuse, but this excuse cannot be advanced for the college man. Unless the time and effort spent acquiring a higher education, in the high school as well as the college, produces men of superior intelligence, of greater ability, and of higher moral standards, it is not doing all that it should do. It should produce our best citizens in every sense of the word. Our educational system should be so constructed as to insure that each boy selects the line of work for which he is best suited. If it did this one thing, we would have more successful men, more satisfied men, and a higher standard of civilization. That it does not do so is evidenced by the growing unrest and the crowded ranks on the lower rungs of the ladder of progress.

In order to help the boy select the work for which he is best suited, a start would have to be made in the lower grades of the grammar schools. Study would have to be made more interesting and interspersed with considerable manual training of a practical kind. When the boy's interest is secured and maintained he will willingly do the necessary studying. He should be given a comprehensive idea of what is required to achieve success. Each step in his progress should be connected in some practical way with the life around him, so

that he can understand its utility. The mere statement that if a boy takes a course in medicine, say, at such and such a university, he will become a successful surgeon, is not of itself true. There is a great difference between passing the tests in college and being a successful surgeon. Ordinarily the boy has little comprehension of these facts. All he sees is the successful doctor driving in his motor car, working a few hours a day, and getting large fees for apparently little work. He expects the college to put him at once into such a position, and is not unjustified in his expectations after reading the claims made.

After the boy graduates he finds actual working conditions not at all what he was led to believe they were. In many cases he finds he is not fitted to follow successfully the line he has spent eight years in studying. If he does not find it out early in life he keeps on plodding away in an uninteresting path and remains a discontented man. How much better it would be to devote the pliable years of a boy's life to finding out what he is best fitted for and then to be absolutely honest with the boy and give him an education of real and immediate value. It would at least start him off right, with something in which he is interested and which he can sell at a good price. This would of course call for a more hearty coöperation of the parents, but with such a system once working we would have more parents with a proper appreciation of their duties and responsibilities. Later, if the boy thought he could afford the time and money, he could go to some institution of learning where he could conduct original research or take up studies in such other branches as he desired. His degrees would then command the respect and attention of employers.

After eight years of study the boy should be equipped to follow some one line of work and he should be able to do that work well, better in fact than non-college men. He should not be obliged to serve a further primary apprenticeship. He should be taught to use his brains, to do his own thinking, to reason and to analyze. He should be taught to be tolerant of others' opinions, to give full value for the money

received, to have proper respect for honest labor, and to conduct himself with courtesy and affability towards those with whom he has to associate.

When an employer hires a transit man he expects the man to be well informed on that and allied subjects. If a boy decides to be a chemist it does not follow that he should study nothing but chemistry, but it does follow that he should know his chemistry and allied subjects well. Whatever else he knows is so much gain.

The actual conditions of life surrounding the boy during the time he is obtaining his education should be more nearly similar to those he will encounter when he starts to work. They should be superior in ideals and morals.

The manner of attending lectures and putting off study till examination, and then studying only sufficiently to pass the tests, does not increase a boy's ability to solve the daily problems of life. This system teaches a boy to do not one bit more work than is actually required of him, and unless a boy is willing to do more than merely enough to hold his job, his advancement is very slow. A man's success depends so much upon his willingness to do more than he is paid to do, that we have a right to expect our college men to be superior, in this respect, to the non-college men. That he does not so regard his work is evidenced by the difficulties he has in adjusting himself to the different conditions. The habit of attending lectures at eight or nine in the morning, quitting early in the afternoons, mostly loafing on Saturdays, and skipping lectures to attend athletic events, does not teach stick-to-itiveness. It does not increase one's desire to be on the job from seven in the morning till six at night, six days in the week, and fifty-two weeks in the year.

The habit of living in expensive fraternity houses, maintained not at all by money which the student himself has earned, does not teach him self-reliance. It does not help him when he has to live in a hall bedroom, paid for from the meager salary he is able to earn. It is quite a long time before he can earn enough money to afford to join similar clubs in

the working world. These clubs form cliques and tend toward snobbishness, and increase his difficulties in readjusting his mode of life. Fraternity life does not increase his respect for any form of honest labor.

Our educational system should teach a high moral standard. Our educational centers should exhibit the highest standard of morals and civilization. Cities like New York, Chicago, Philadelphia, Boston and Pittsburgh should be examples of good government and free from vice. Unless the average morality of college men is better than that of non-college men, the system has failed in one of its fundamental duties, to establish high ideals and lead the way. It is not sufficient to say that this is a function of the Church, for surely a boy can be taught high ideals and clean living without interfering in any way with religion or creeds. Since our advancement as a nation depends upon our advancement as individuals, it follows that we cannot advance rapidly by neglecting the moral character. It is of more importance that a boy should grow into a clean and strong manhood than that he should be able to conjugate a verb or understand the binomial theorem. A thorough course in eugenics would be of more value than Greek or Latin and would show more tangible results. The university takes the boy away from all home influences at an impressionable age and fails to substitute anything in its place. It throws the boy into association with other boys of all degrees of morals and assumes that the boy knows enough and is strong enough to do only that which is right and good. This is an erroneous assumption and having started with a false premise the conclusions must be incorrect. The present system starts too late and concerns itself entirely too little with these important matters.

Our educational system should teach every boy a proper appreciation of his duties and responsibilities as a father, as a citizen and as a man. Every man, no matter what his walk in life, is called upon to exercise his franchise, and by his vote pass judgment on many important questions. Hence he should be taught a clear understanding of how best to use this

gift. Our educational system should teach every boy a proper respect for the law and those in authority. If it did this there would be less agitation for the recall of judges, less necessity for the prosecution of graft, and some of our brainiest men would cease to find employment in searching out ways for others to avoid the law. The system is primarily responsible in its failure to cure most of our civic and moral ills, because it has charge of our boys during the most pliable years of their lives. Our educational institutions have the power, through association and by example, to so mould character that the men who have had its advantages will stand out as conspicuous examples for others to follow. The leniency with which the school authorities regard the pranks of college students does not inspire the boy with a wholesome respect for law and authority. After eight years of this attitude on the part of those to whom he should look for guidance, he cannot understand why the same things done after graduation are considered reprehensible. The boy has to readjust his viewpoint and to unlearn many things, thereby wasting considerable time starting over again.

All of these things our present system claims to do; some of them it does, many it fails to do. Its spirit of altruism is often perverted by the dollar. The universities advertise and claim advantages from the fact that certain eminent scholars are members of their faculty when, as a matter of fact, these eminent scholars devote their time mostly to research and seldom come in contact with the student body. They leave the matter of the boy's actual education in the hands of some assistant instructor.

The system devotes too little attention to the individual. Many of the teachers are poorly paid and incompetent. A man would select a foreman for his stock farm with more care, and pay him more, than do our school authorities in selecting teachers. So many subjects are taught that in none of them are the children really well grounded, yet it is upon such poor foundations that our universities attempt to build.

It is necessary to maintain a corps of truant officers and to

bring the boy into court to force his attendance at school, partly because the boy is not interested in his work and can see no connection between what he is forced to learn and what he wants to accomplish. One of the reasons of the growth of correspondence schools is the failure of our public schools and colleges to produce the results expected of them. The more progress the correspondence schools make, the greater should be the efforts of the colleges to remedy their defects.

As at present constituted, the system is top heavy because the university endeavors to build upon an insecure foundation. The universities are primarily at fault because the high schools base their courses of study upon the entrance requirements of the higher institutions. If the universities would change their requirements the high schools would have to follow and necessarily also the grammar schools. Because the universities occupy this keystone position, they are primarily responsible for any failures of the system.

We can advance only through education and those who have or assume this responsibility should not look lightly on the matter. They should not allow their judgment to be warped by financial considerations. The question is clearly an altruistic one in that we should endeavor at all times to give freely of the best there is in us, and strive earnestly to make the best better.

ENGLISH. MISCELLANEOUS FAULTY EXPRESSIONS.*

BY VICTOR C. ALDERSON,

President, Colorado School of Mines.

Affect—"Affect" means to influence, *e. g.*, Trade would be seriously affected by a war. It is always used as a verb, never as a noun. It is often confused with "effect." "Effect" (a verb) means to "bring to pass," *e. g.*, He effected a reconciliation. "Effect" (a noun) means "result," *e. g.*, The drug had a fatal effect.

After—

Inaccurate: After having written.

Right: After writing.

Alternative—(Used where there is a choice of two courses.)

Wrong: There is still a third alternative.

Right: Still a third course may be adopted.

And—"And" is often incorrectly used instead of "to."

Wrong: He said he was going up and clean out the attic.

And which—

Wrong: The rocks exposed here and which occur nowhere else in this quadrangle, ...

Right: The rocks exposed here which occur nowhere else in this quadrangle, ...

Appreciate—Appreciate means "to estimate justly" or "to

* The material in this article was taken from a somewhat longer compilation intended for the use of the junior and senior classes of the Colorado School of Mines. No claim is made for originality. Woolley's "Handbook of Composition," Hill's "Principles of Rhetoric," Rickard's "Technical Writing," Wood's "Suggestions to Authors of Papers Submitted for Publication by the United States Geological Survey," student's themes, and various other sources have been drawn on freely.

value highly," *e. g.,* I appreciate the service. "Appreciate" should not be modified by "greatly" or "very much."

As (1)—The frequent use of "as" as a casual conjunction is a mark of ill-educated writers. Where "as" occurs in this sense there should usually be no conjunction.

Bad: Excuse my short letter as I am buried in work.

Right: Excuse my short letter; I am buried in work.

As (2)—In negative statements and in questions implying a negative answer, good usage requires the correlatives "so" . . . "as" rather than the correlatives "as" . . . "as."

Right: The modern nations are not so artistic as were the ancient nations.

Awful—"Awful" means inspiring with awe, *e. g.,* The awful presence of the King. Awful should not be used loosely. Say not "an awful mistake," but "a serious or disastrous mistake"; not "an awful blunder," but "a ludicrous blunder"; not, "awful manners," but "uncivil or ill-bred manners." Choose an adjective that definitely expresses your meaning.

Badly—"Badly" should not be used for "a great deal," or "very much."

Wrong: I want to see you badly.

Right: I want very much to see you.

Balance—Do not use "balance" in the sense of "remainder."

Bad: One was an Italian; the balance were Greeks.

Bank on, Take stock in—These are slang phrases. Use instead "rely on" or "trust in."

Bunch—This is a vulgarism for "group" or "party."

But that, but what—These are incorrect after "doubt."

Wrong: I had no doubt but what he would bite.

Right: I had no doubt that he would bite.

Calculate—This is a vulgarism for "think," "suppose," "expect," or "intend."

Can, May—Use "can" in speaking of what is possible; "may" in speaking of what is permissible.

Wrong: Can I have a catalog?

Right: May I have a catalog?

Right: May students (or are students allowed to) (or permitted to) hand in their themes on Monday?

Cases, Places, Instances—

Wrong: In many cases, notably at pulp mills, it is evident that larger turbines could have been used with advantage.

Right: In many places . . .

Wrong: In many cases these well records have been carelessly kept.

Right: Many of these well records have been carelessly kept.

Wrong: This coal has been measured in many instances.

Right: This coal has been measured in many places.

Wrong: In only one instance is any other means of irrigation used, namely, in the case of the Johnson ranch. Here "instance," "namely," and "case" are unnecessary.

Cause—Complete such an expression as "the cause was" with a predicate noun or a noun clause.

Wrong: The cause of his failure was on account of his imprudence.

Right: The cause of his failure was his imprudence (or, that he was imprudent).

Claim—"Claim" means "to demand as due," *e. g.,* I claim the reward. Do not use for "assert" or "maintain."

Company—A vulgarism for "companion," "guest," or "escort."

Continual—This is not synonymous with "continuous." "Continual" means "frequently repeated," *e. g.,* He coughs continually. "Continuous" means "without cessation," "continuing uninterrupted," *e. g.,* He slept continuously for ten hours.

Crowd—Do not use for "party" or "company."

Data, Phenomena, Strata—These are plural, not singular forms. The singular forms are "datum," "phenomenon," and "stratum."

Deal—This is a vulgarism for "transaction," "agreement," or "arrangement."

Different—"Different" should not be completed by a "than" clause, but always by a "from" clause.

Wrong: This method is different than the former one.

Diner, Sleeper, Smoker—"Dining car," "sleeping car," and "smoking car" are better.

Do away with—This phrase is hackneyed and inelegant. Use "abolish," "discontinue," or "eliminate."

Don't—This is a contraction of "do not."

Wrong: He don't know.

Right: He doesn't know.

Right: I don't know, we don't know, you don't know, they don't know.

Down—"Down," when used as a verb, is a vulgarism.

Wrong: He downed his opponent.

Right: He defeated (or subdued, or got the best of) his opponent.

Due to—"Due to" should not be used unless the "due" modifies some noun.

Wrong: The forces were divided, due to a misunderstanding.

Right: The forces were divided through (or because of) a misunderstanding.

Each other—"Each other" is often misused for "one another." Do not say "each other" unless each member of a group is represented as in a certain relation to every other member.

Absurd: Improvements in apparatus are rapidly following each other.

Right: The two brothers hated each other.

Right: They all agreed to stand by each other. (Each member of the party agreed to stand by every other member.)

Eating house, Eating place—"Restaurant" and "dining room" are better.

Either, Neither—"Either" and "neither" are used to designate one of two persons or things, not one of three or more.

Wrong: I asked Bob, Jim and Frank, but neither of them was willing.

Right: I asked Bob, Jim and Frank, but none of them was willing (or, no one of them was willing).

Elegant—"Elegant" means "excelling in the power to discriminate properly," *e. g.*, An elegant gentleman. Say not an "elegant view," but a "beautiful view"; not an "elegant pie," but a "delicious pie." Choose an adjective that definitely expresses your meaning.

Else—

Wrong: Somebody's else book.

Right: Somebody else's book.

Enthuse—

Vulgar: He doesn't enthuse me.

Right: He doesn't arouse any enthusiasm in me.

Vulgar: She never enthuses.

Right: She never becomes enthusiastic.

Etc.—Use a definite term in place of "etc." or omit it. Never use etc.

Wrong: She was more beautiful, witty, interesting, etc., than any other lady.

Right: She was more beautiful, witty, and interesting than any other lady.

Fine—"Fine" is a word of indefinite meaning. Avoid the habitual loose use of it. Say not a "fine explanation," but a "clear explanation"; not a "fine spring of water," but a "refreshing or delicious spring of water"; not a "fine toast-master," but a "witty toastmaster." Choose a word of definite meaning.

First-rate—"First-rate" may be used as an adjective but not as an adverb.

Wrong: He plays tennis first-rate.

Right: He is a first-rate player.

Firstly—

Wrong: Firstly. Secondly. Thirdly.

Right: First. Secondly. Thirdly.

Fix (1)—"Fix" is slang for "plight" or "condition."

Fix (2)—The verb "fix" means to "attach." It should not

be used for "repair" or "arrange." "Fix up" is objectionable.

Following—"Following" is not properly used for "after."

Wrong: Following this there was a second period of uplift.

Right: After this there was a second period of uplift.

Former, Latter—These are convenient terms that are likely to be overused. As a general rule, it is better to repeat the words to which they refer.

From the standpoint of—

Wrong: From the standpoint of coal mining . . .

Wrong: From the viewpoint of farming . . .

"Coal mining" and "farming" can have no viewpoint, but the "coal miner" and "the farmer" can.

Bad: Viewed from the standpoint of age these rocks are . . .

Right: Considered as to age, these rocks are . . .

Gentleman, Lady—"Gentleman and lady" are properly used to designate persons of refined speech and manners, as distinguished from ill-bred or uncultivated persons. Their use to designate mere sex is a vulgarism.

Vulgar: Saleslady, business gentleman, lady stenographer. There are lady cab-drivers in Paris. Cornell admits ladies, but Williams admits only gentlemen. Ladies' cloak room. Use man, woman. The use of "man" and "woman" need never be shunned; even where "lady" or "gentleman" may be used correctly, "man" or "woman" is equally polite, and is often preferable.

Right: Is your wife a Massachusetts woman? You are the only woman I know who drives a motor. Are you the man I met last spring in Denver?

Gentleman friend, Lady friend—These terms, not in themselves objectionable, have, through the use that has been made of them, become ambiguous and vulgar. "Gentleman of one's acquaintance" or "lady of one's acquaintance" are preferable.

Get—

Wrong: I didn't get to go to the lecture.

Right: I was unable to go to the lecture.

Get-up—"Get-up" is an inelegant expression loosely used for "organize," "arrange," or "prepare."

Got—"Get" means to "secure"; "got" should not be used unless the intended meaning is "secured."

Wrong: Have you got a knife with you?

Right: Have you a knife with you?

Gotten—

Wrong: He has gotten his reward at last.

Right: He has got his reward at last.

Grand—"Grand" means "on a large scale," "imposing," *e. g.,* A grand mountain chain. Say not a "grand day," but a "beautiful day"; not a "grand time," but a "delightful time." Choose an adjective that definitely expresses your meaning.

Grip, Grip-sack—Traveling-bag is preferable.

Guess—"Guess" should not be used to express supposition, expectation, or intention. Use "think," "suppose," "expect," "mean," or "intend."

Had—

Wrong: Farmer Jones had a sheep die last week.

Right: One of Farmer Jones' sheep died last week.

Have—Do not use "have" instead of "study."

Wrong: Did you have English last year?

Hear to it—A vulgarism. Use "consent to it" or "allow it."

Help—A vulgarism. Use servant, servants, or employees.

Hired girl—A vulgarism. Use "maid" or "servant."

Hustle—"Hustle" is a vulgarism when used intransitively to mean "hasten" or "hurry." It may be used correctly with a direct object.

Wrong: People were hustling about in confusion.

Right: People were hurrying about in confusion.

Right: The police hustled the objectors out of the hall.

If—"If" should not be used as a synonym for "whether."

Wrong: I don't know if I can.

In—"In" should not be used to express motion. Use "into."

Wrong: He went in the bank.

Inaugurate, Initiate—

Wrong: Work was inaugurated in June.

Right: Work was begun in June.

Wrong: The investigation was initiated in 1908.

Right: The investigation was begun in 1908.

In back of—"In front of" is correct; "in back of" is a vulgarism. Use "behind."

In question—The phrase "in question" is used by some writers concerning matters that are not at all in question.

Wrong: The lake in question.

Right: The lake mentioned, or this lake.

Inside, Outside—Do not say "inside of" or "outside of." Omit the "of." Say simply "outside" and "inside."

Right: They were caught inside the walls.

Inside of—In time expressions, "inside of" is a vulgarism for "within."

Wrong: It will disappear inside of a week.

Install, Prosecute—Such words are the stock-in-trade of the wild-catters.

Wrong: The principal work being prosecuted is in the shaft.

Right: The principal work is being done in the shaft.

Wrong: A vigorous campaign of development is being prosecuted.

Right: Steps have been taken to develop the mine rapidly.

In the vicinity of, In the neighborhood of—These phrases are frequently used for "about" or "nearby."

Wrong: The cost of production is in the vicinity of 50 per-cent. of the selling price.

Right: The cost of production is about 50 per cent. of the selling price.

Wrong: Its population is in the neighborhood of 1,500.

Right: Its population is about 1,500.

Wrong: Something like half a mile.

Right: About half a mile.

Is responsible for—This phrase is improperly used where no responsibility is involved.

Wrong: The uplift of the Ben Lomond block is responsible for this.

Wrong: An earthquake was responsible for this fault.

Wrong: A flood in the eighties was responsible for this damage.

It—Care should be taken in the use of "it"; there should be no uncertainty as to the noun to which it refers. The following examples are bad:

Owing to the lapse of time between the storm and the collecting of the information it is incomplete.

The water found here, coming through the gravel beds, is cool, clear and delicious and the natural drainage renders it a most desirable place of residence.

An inventor of a new feeding bottle for infants once sent out the following among his directions for using: "When the baby is done drinking it must be unscrewed and laid in a cool place under the hydrant. If the baby does not thrive on fresh milk it should be boiled."

Kind, Sort—

Wrong: I don't like those kind (sort).

Right: I don't like that kind (sort).

Kind of, Sort of—"Kind of" and "sort of" should not be used to modify verbs or adjectives. Use "somewhat," "somehow," "for some reason," "rather," or "after a fashion."

Wrong: People who kind of chill you.

Right: People who somehow chill you.

Wrong: The man who does nothing but study gets sort of dull.

Wrong: I kind of felt my way at first.

Right: I felt my way, after a fashion, at first.

Lay—"Lay" is often confounded with "lie." "Lay" is the causative of "lie"; "to lay" means "to cause to lie."

Less—"Less" is a vulgarism for "fewer."

Wrong: Less men were hurt this year than last.

Lessee—The "leaser" is the man who grants the "lease"; the "lessee" is the man who takes the "lease."

Wrong: The leasers paid 20 per cent. royalty.

Like—"Like" is a vulgarism when it is used to introduce a subject with a verb. Use "as" or "as if." "Like" is correct when followed by a substantive without a verb.

Wrong: He acted like the rest did.

Right: He acted like the rest, or as the rest did.

Wrong: I felt like I had done something generous.

Right: I felt as if I had done something generous, or I felt like a philanthropist.

Line—The following uses of "line" are characteristic of ill-educated writers and speakers.

(*a*) The loose use of "line" in the sense of "kind" or "business," or in other senses for which there are precise words.

Bad: What line of work are you doing now?

Bad: I am now in the hardware line.

(*b*) The use of "line" shown in the following:

Bad: I like anything in the card line.

Right: I like any game of cards.

Bad: Was there anything in the refreshment line?

Bad: I am not very good in the walking line.

(*c*) The use of "along the line of" or "in the line of" for "in connection with," "in regard to," "about," "on the subject of," "in the nature of," "by the way of."

Bad: He was also famous along the line of literature.

Right: He was also famous in literature.

Bad: The dean said some things along the line of athletics.

Bad: We are planning something in the line of a surprise.

Right: We are planning something by way of surprise.

(*d*) The use of "along this or that line" or "in this or that line" for "in or on or in regard to this or that subject," "in this or that respect," "of this or that sort."

Bad: Let me tell you something along that line.

Bad: If he is so weak in physics and chemistry, he needs some tutoring along those lines.

Bad: I need some tacks. Have you anything along that line?

Right: I need some tacks. Have you anything of that sort?

Locate—Do not misuse "locate" for "place," "situate," "reside," or "find." It is correct if used intransitively.

Wrong: The company located the mill on the side of Gold Hill.

Right: The company located the millsite on the side of Gold Hill.

Right: The company built the mill on the side of Gold Hill.

Wrong: He is located at Leadville.

Right: He resides (or lives) at Leadville.

Wrong: The superintendent located the ore-shoot at the fourth level.

Right: The superintendent found the ore-shoot at the fourth level.

Wrong: He located his wife in Chicago.

Right: He found his wife in Chicago.

Lose out, Win out—These are slang expressions. Omit "out."

Mad—"Mad" means "insane." It should not be used to mean "angry."

Near by—"Near by" should not be used as an adjective.

Wrong: A near-by house.

Right: A house that stood near-by.

Right: A neighboring, or adjacent, house.

Nice—"Nice" means "keen or precise in discrimination" or "delicately or precisely made," *e. g.*, a nice judge of values, a nice discrimination. It should not be used loosely. Say not, "a nice fellow," but "an agreeable, an admirable, a conscientious, or an honorable fellow"; not a "nice time," but a "pleasant time." Choose the adjective that definitely expresses your meaning.

No good—"No good" is a vulgarism when used adjectively. Use "worthless" or "of no value."

Occur—"Occur" is frequently overworked, *e. g.*, The fluorspar mines occur in Pope and Hardin counties. No large streams occur in this area. Hardwood trees occur on these slopes.

Off of—"Off of" is a vulgarism for "off."

Bad: Keep off of the grass.

On the side—"On the side" is a vulgarism for "incidental," "collateral," or "occasional."

One—"One" should never be preceded immediately by "a."

Bad: Not a one was hurt.

Right: Not one of them was hurt.

Ones—"The ones" is crude. Use "those."

Crude: The ones who are ready may come.

Only—"Only" should be placed as near to the word it qualifies as the proper construction of the sentence will permit.

Wrong: Their presence can only be determined by actual tests.

Right: Their presence can be determined only by actual tests.

Or—"Or" should not be correlated with "neither." Use "nor."

Wrong: Neither the gold or the silver is saved.

Right: Neither the gold nor the silver is saved.

Ought—The combination of "ought" with "had" is a vulgarism.

Bad: You hadn't ought to have entered.

Right: You ought not to have entered.

Bad: We ought to send, had we not?

Right: We ought to send, ought we not?

Outloud—"Outloud" is a puerility for "aloud."

Outside of—"Outside of" should not be used for "aside from."

Wrong: Outside of this mistake, it is very good.

Over—"Over" is frequently misused for "more than."

Wrong: This coal is over four feet thick.

Over with—"Over with" is a vulgarism. Say "over."

Vulgar: The game is over with.

Overly—"Overly" is a vulgarism. Say "over."

Vulgar: I am not overly anxious.

Party—Do not use "party" to mean simply a "person."

Wrong: The party who wrote that article must have been a scholar.

Per—"Per" is used correctly with Latin words, as "per annum," "per diem," " per cent." It is not generally used with English words.

Inelegant: Three dollars per day; one suicide per week; $3,000 per year; thirteen cents per gallon.

Right: Three dollars a day; one suicide a week; $3,000 a year; thirteen cents a gallon.

Permanent—"Permanent" should not be confused with "persistent" or "continuous."

Wrong: The ore deposit is of a permanent character.

Right: The ore deposit is of a persistent character.

Plan—"Plan" should not be combined with "on."

Wrong: We planned on taking a walk.

Right: We planned taking a walk; or, we planned to take a walk.

Plenty (1)—"Plenty" is a vulgarism when used as an adjective. Say "plentiful."

Wrong: Wheat is plenty.

Plenty (2)—"Plenty" is incorrectly used as an adverb.

Wrong: It is plenty good enough.

Right: It is quite good enough.

Postal—Use "postal card" instead of "postal."

Posted—"Posted" is frequently used for "informed."

Wrong: Keep me posted.

Wrong: He is well posted about politics.

Proposition—"Proposition" means "a thing proposed," or "the act of proposing," *e. g.*, He made a proposition to sell. Avoid the use of "proposition" for "work" or "task."

Bad: To sink the shaft was a hard proposition.

Right: To sink the shaft was a hard piece of work.

Bad: The library-buffet car is the most comfortable proposition on wheels.

Right: The library-buffet car is the most comfortable vehicle on wheels.

Proven—"Proven" is not in good use. Use "proved."

Put in—"Put in" is a vulgarism for "spend" or "occupy."

Wrong: I put in three hours.

Put in an appearance—This is a vulgarism for "appear."

Quality—"Quality" means "characteristic" or "trait," *e. g.*, The qualities of birch-bark are lightness of color, thinness, and smoothness. It should not be used without intelligent regard to its meaning.

Bad: The social qualities of college life are more in evidence in winter.

Right: The social activities of college life are more apparent in the winter.

Bad: He gives three qualities of a business man: Have something to say, say it, and stop talking.

Right: He gives three maxims for a business man.

Quite—"Quite" means (*a*) "wholly," *e. g.*, The stream is now quite dry; or (*b*) "greatly" or "very," *e. g.*, We could see it quite distinctly. "Quite" is a provincialism when used in the sense of "slightly," "not very."

Wrong: The room is quite large.

Right: The room is moderately large.

Quite a few—"Quite a few" is incorrectly used for "a good many" or "a considerable number."

Quite a little—"Quite a little" is incorrectly used for "a considerable amount" or "a good deal."

(*To be concluded*)

FUNDAMENTALS OF EDUCATION AND THE SPHERICAL-WANT SYSTEM.*

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VII.

Efficiency of the Educational Machine.

An efficiency of a hundred per cent. for our school system would mean that each pupil would be directed into that sphere of activity for which he is best adapted, and in which he would be the most useful to himself and to the community. It would therefore mean the individual treatment of students by practically infallible teachers in the home, school and community. In addition, an understanding of the **true object of life** would be necessary in order to know how to prepare the young for life. A consensus of opinion on such a subject is not yet possible. We know life is, just as we know there is something we call gravitation; but why and for what infinite purpose either of them is, we know principally by faith. We all agree, however, that we are here to improve physically, mentally, and morally. Our intelligence, as well as our instincts, tells us this. We do not all agree, however, on the "improvement" or the means.

When we reckon up the wasted time, the misdirected efforts, the expense of training the right boy for the wrong place, the formation of bad habits of thought and physical action, and the like, one wonders whether our school machine has an efficiency of twenty per cent. The estimate all depends, of course, upon the viewpoint of the individual. In any case, we can all agree that there is plenty of room for improvement,

* Continued from December BULLETIN, p. 247.

especially if we bear in mind that much knowledge is acquired outside of and in spite of the schools, or at least much is done by boys without any incentive from the schools and for which the schools shall receive no credit.

When one wishes to improve the efficiency of an electrical machine, one considers the machine in parts and studies the separate losses in order to locate the loss most easily reduced. Similarly, there are certain elements or factors in education which may be set out and considered separately so as to determine where profitable changes may be made. Three of the most important educational factors are **heredity, environment** and **habits.** We might go a step further and take the opinion of many scientists, making it **habits** only, since many hereditary characteristics are said to be due to the habits formed by previous generations, going back to the beginning of life on this earth. It is said that right-handedness is an "hereditary habit." Inasmuch as habits of all kinds result from mental and physical actions which have been repeated again and again as a result of correspondingly recurring external and internal stimuli, we might consider **environment** the most important factor. This is because the environment of an individual included all influences acting upon him. The readiness of the individual to adapt himself to the surrounding conditions is a measure of his chances to live. In other words, the ability of the individual to respond the right way, the right amount, and to the right stimuli of his environment or of his sphere of life, determines his success.

One reason why men and women of today have their present physical and mental characteristics, whether good or bad, is because other types, that were, failed to meet the demands of their environment and, hence, are no more. Those now living are of two classes; the properly adaptable, and those marked by nature to be the last, or near the last, link in a chain of individuals extending back to the beginning. The second class must, of course, be kept as small as possible in order that the environment may be favorable for those worthy to continue.

Nature appears to hate deviations from the normal, and

eliminates them as soon as possible. Geniuses are under nature's ban. They are individuals who are abnormally sensitive to certain stimuli and often are, in consequence, near the end of their family lines. It is well known that certain races are immune to certain complaints because of the elimination of those who were not immune while young.

Needless to say, **nature demands** a proper response to the stimuli of one's environment, whether it be that of childhood, school, or of mature life. Hence no period of life, such as the school period, can be set apart as exempt from nature's laws or even exempt from the limitations of the laws of society and the state. Yet in many respects our schools are tending to educate children away from real life instead of guiding them into it, so that the more children are taught, under the present system, the less they "know" about some subjects. They should not be translated into another life when they go to school or to church.

Educational Elements or Factors.

If we were considering particular pupils, the factors would perhaps be stated in their order of action, thus:

(1) Material	(1) Pupils.
Quality of material ..	Heredity—having especially to do with the immediate ancestors.
(2) Factory	(2) Environment—including all factors of home, school, community, climate, etc.
Workmen	Teachers, parents and preachers.
Interest	Spirit.
(3) Product	(3) Trained citizens.
Skill	Habits—mental and physical—knowledge.
Products of commerce, etc. ..	Human physical and mental energy.

Going down either list, we arrive at the same question—What is the efficiency, and how can we improve it in order to increase our individual and racial success? It would appear to be an educational problem, or rather **the** educational problem, to make out of the individual a physical and mental mechanism of the highest possible efficiency.

For convenience in a more detailed discussion of the educational factors which determine the efficiency of a school system, we may list the important elements of education in the following order:

1. Environment—parental, school, community, national, climatic, etc.
2. Heredity—type, and mental and physical strength.
3. Wants—or necessities, needs and desires, and their causes.
4. Will, ambition and interest.
5. Activity, and its directions and limits in satisfying wants. Foresight.
6. Experience—schooling, discipline.
7. Competition and selfishness.
8. Habits.

Environment.

Environmental education, or the knowledge or habits gathered as a result of contact with daily life in seeking to satisfy our natural and artificial wants, is the most important. We are generally more dependent upon hereditary tendencies and upon our environments, for our characteristic habits, than upon systematized school education. The average person is admittedly very greatly affected, while yet immature, by his environment. Inasmuch as a structure cannot be stronger than its foundations, we should pay special attention to all educational factors affecting the young. Wise men control their actions by placing themselves under suitable obligations or under suitable environmental pressure. These men are leaders because they know how to direct themselves by selecting their own stimuli.

The immediate and present environment is the most important thing with the very young, because most of their actions are reflex-physical, while those of the older are more reflective or mental in character. The young demand the opportunity of immediate response to stimuli, or the immediate application of ideas; a postgraduate can make a mental application and

wait. For the above reason, teachers as well as mothers who can dictate the character of the environment or sphere of life, can select, to a large extent, the stimuli or influences, and direct the wants and repeated activities of children so as to form the desired habits. Thus, control of the environment gives, in a large part, control of the stimuli and, hence, the wants. If the wants are thus predirected, actions and lines of action come under control while still emanating from the will and intelligence of the pupil. **Limits** to action in social life must, of course, be set by discipline, just as nature sets limits and marks boundaries by physical and mental pain, or by early death, no matter who is responsible for the errors. When repeated mental and physical actions are controlled, almost any desired habits may result.

The following outline shows the sequence of results following the subjection of an individual to a given environment as proposed in the spherical-want system:

I. **Sphere of Observation (Environment).**
  Stimuli, external with internal.
  Wants; instincts, intuitions and ideas; interest; ambition.
  Will; concentration—attention.
II. **Sphere of Activity** (mental and physical). (Limits begin with activity.)
  Experience, real and imaginary.
    Repeated mental and physical actions.
      Habits, mental and physical.
  Limits to action set by nature and society.
    Discipline, correction, regulation, control, and prohibition.
      Competition.
        Selfishness.
III. **Sphere of Knowledge.**
  Mental and physical habits resulting from real and imaginary personal experiences.

Environment.

Man has a tremendous advantage over the lower animals in that he can control or select his environment, thus subjecting himself to such environmental pressure as will develop his

race in almost any desired direction. Further, man has a great advantage, or disadvantage, in being far more susceptible to the environment created by his fellows than is the case with lower animals. Man has only to strive with all his intelligence to place himself in harmony with the unchanging laws of nature, and then if he wills to do so, there is no limit in sight to his progress. Yet man may use the same forces in nature to send himself farther down than the lower animals. If man refuses to bow to the will of the All-Powerful, as manifested both in religion and in science, his fallibility of judgment, his personal selfishness, will make degeneration and elimination far easier than in the case of the lower animals.

Some may reply that the elimination of the weak is a good thing, but we should not forget that degeneration ending in elimination not only aplies to individuals but to races. The Indians are disappearing, and if degeneration of too many individuals of our race occurs these will carry the others with them.

Heredity.

Hereditary qualities, especially as to health and predisposition to sickness, depend mostly upon what the immediate ancestors were, and what they did or didn't do. There is no use asking whether one would prefer being the child of healthy, poor parents or rich, sickly ones. Racial and family characteristics are dependent upon factors which often go back a great many generations.

About the only thing that educators can do with the hereditary factor is to do the best they may with the material at hand, and so train the present generation that the next generation may profit by properly directed laws of heredity. A tame duck raises wild goslings from wild goose eggs. The foster mother's influence and the other factors of domestic environment, however, make the geese less wild, so that a few generations might produce fairly tame wild geese—providing their wings were clipped to keep them within limits.

Physically or mentally weak parents, according to the laws of probability, produce weak children. If these children survive by adopting or seeking a special environment, then nature generally retaliates by applying the regular rule to the first generation of weaklings exposed to the common environment. A great reduction in the mortality of infants makes good newspaper reading, but it may or may not be eventually a gain to the race. There are three answers to this problem: educate weaklings not to marry; pass laws preventing it; or raise their weak offspring and trust in Providence. The latter solution appeals to a scientist about as much as walking over a rotten bridge and trusting in gravitation. A few visits to insane asylums, "schools" for the feeble-minded, schools for the deaf, dumb, and blind, and to prisons and slums, would establish the importance of the heredity factor. The cost in money resulting from neglect of the subject might also be instructive.

Wants.

Wants may be classified as those resulting directly from nature's demands as for food and comfort, for variations in form of necessities and those for satisfying more or less non-essential artificial tastes. The present and immediate environment largely determines the stimuli for all except the fundamental necessities. Children "want" things they see and hear about.

The great problem of every individual and of every race is that of supplying natural and artificial, mental and physical, wants. Without the want, there could be no demand and no value. Because men want things, they work and fight. Wants are the causes of wars. Human, mental and physical energy applied to natural resources or materials, and aided by the forces of nature, directed in machines, produces things which are wanted. Consumption tends to satisfy wants. Distribution is a detail or a part of production.

The amount of intensity of a want is usually expressed in terms of an elastic unit called the dollar. So, also, is the value

(salary, wage, or other reward) of human energy, and the value of natural materials, opportunities, privileges, etc., rated in terms of money. Some wants are too great to be expressed in terms of money, in which case human life or the right to live is used as the unit. There are other units.

Surely we should not neglect to make use of the individual wants of pupils in order to direct educating actions.

Will, Ambition, and Interest.

The **will** is a measure of the intensity of wants, and also a measure of mental force. The effectiveness of this force, however, depends upon the intelligence directing it. Strong desires and a strong mind can, by overcoming difficulties, develop an habitually strong will. The will can never be developed if every want is satisfied without effort or competition. He succeeds who wills and overcomes. Will is the father of initiative, as necessity is the mother of invention. A strong will stimulating intelligence can move anything for which there is a fulcrum. Ambition and interest depend upon the intensity of one's wants, and upon the practice and success in satisfying them against opposition and competition. The power of concentration depends upon the wants, will, intelligence, habits and health.

Activity and Foresight.

Most of the physical and mental activity of adults takes the direction of a resultant of several mental stimuli, some of which are internal and some external. Naturally, the resultant or conclusion is most influenced in intensity and direction by the stronger forces. A selfish or acquisitive person would in general act along lines tending to the satisfaction of selfish wants. If one knows a man's strongest trait—selfishness, love of power, praise or money, etc.—it is generally easy to foretell his line of action in a given case. Thoughtless people take lines of action according to their personal traits and habits, without much conscious thought, like a child getting away

from a hot stove without analyzing the elements or mental forces. The wise hesitate and carefully consider all the elements entering into the mental conclusion and, further, they imagine out the probable experience following their proposed line of action. This is **foresight,** and it must be based largely on past personal experience. Children should try out their own conclusions and then stand the **certain** consequences. It will not help them much to fill them up with stories of others' mistakes and successes unless they have some of their own.

The most effective activities are those directed by the individual's own will and intelligence as determined by the individual's wants. Mental and physical action can also be induced by fear of punishment, or in other words, by the individual's "dont wants." Boys generally learn spelling, grammar, arithmetic, etc., in school because they don't want the alternatives. In many cases they want neither. In order to fill boys with ideas they are forced by fear of punishment, of one kind or another, to many inefficient mental and physical actions. They form habits of skimming over things they don't want now, and much they never will want. They are allowed to forget that they are going against certain stonewall limitations later in life. They are advised to be good, when spanking might be better than advice. It is shallow-minded kindness to hesitate in extracting a hopelessly decayed tooth because it would hurt now. It is the same in the case of actions leading to bad habits. If each bad act were followed immediately by a severe mental or physical shock, with the certainty and lack of feeling that accompanies a misuse of the law of gravitation, the corrective factors of fear, force, and love, would be ideal.

The other way to eliminate bad actions and habits is to smother them with good ones.

Experience.

A pupil finds the limits set by his particular environment very largely through **experiences,** most of which are not agree-

able. A child should not, therefore, be so hedged in that he cannot make mistakes of sufficient moment to be convincing. If a pupil is hedged in an artificial sphere, he is liable to fall far, later on. Children must have actual physical and mental experience, in the common environment, to develop foresight; hence, the possibilities in vocational training. The way to learn the real size of a dollar is to make one. The way to learn about things is to use them or make them, and not merely to read their descriptions, while living in an artificial or special sphere of life.

Civilization demands coöperation. It is bad, and unnecessary, to place the young in an artificial sphere of life and habituate them to lines of action that will meet opposition later in life. **The babyhood sphere or environment, that of the child, school boy, young man, and man should be the same sphere continuously expanded from almost nothing at birth.** The habits acquired in the miniature sphere of childhood should be consistent with the demands and limits of that of mature life.

The best way of directing actions along useful lines is, of course, to prevent, as already indicated, improper desires and induce good ones. If the young repeat bad actions and develop bad habits, they soon reach certain limits. The laws of nature, the rules and conventions of society, public sentiment, and the laws of the state set up objections which eventually may become the undoing of those guilty of wrong or misdirected actions.

These limitations cannot be avoided. Children from birth are subjected to them. A boy of 14, on beginning to learn his trade, finds his liberty of action very small. Nature, parents, his fellows, the state, and his employer with shop rules, time clocks, orders and directions, place the boy in a channel. He may go forward or backward as far as he likes, or is able, but in the channels set by nature and society or civilization, he must remain.

Competition and Selfishness.

Selfishness, in some form or other, accompanies every active want when there is competition. It is behind every business venture. Some forms of selfishness are regarded, however, as philanthropy. This is the case, for example, when a man desires power, praise, the joy of doing something, or money which will satisfy not only his wants but those of others at the same time. A man gives alms to a beggar for selfish reasons—because it makes the giver feel good, or less bad than not giving.

Ordinarily, we think of a selfish person as one who strives to satisfy his wants at the expense of others. The man who strives to enrich himself to the detriment of others by misusing the directing power of money, and the man who uses his influence over voters, for similar selfish reasons, are both equally selfish. The difference lies only in the form of power used.

Beginning with the unselfishness, or philanthropic selfishness, as taught in the Bible, as read in the history of martyrs, in stories of wars, and as practised by the named and unnamed heroes of daily life, we may go step by step from those who seek to satisfy their wants without hurting others—**the square deal doctrine**—to those who are willing to rob or murder in order to further their interests. The latter run a big risk and play a losing game. Last of all, we come to those who energetically force the satisfaction of their artificial wants above the pressing moral and physical necessities of the masses. Many of our "best citizens" belong to this class. They run no risk, and hence are the source of greatest danger to ideals and racial health. They cannot be especially blamed individually, because they are a product of an environment for which we are all individually and collectively responsible to the extent of the health, training, and intelligence received from the preceding generation.

Reprehensible selfishness can easily be detected by the individual if instead of asking himself, "What do I get out of this?" he would ask, "Am I getting out of this what I would

be willing to pay others under similar conditions, and is the transaction to the best interest of my people?" The answer we most often hear is, "If I don't, some one else will, and I must have money." There is no reasonable limit to the **want power** of the average man or coöperation. An opposing or controlling force is necessary.

Habits.

A physical or mental habit results when a thought or action is repeated a sufficient number of times. A trained mind acquires a habit easily. Certain people learn some things so quickly that we say they have inherited a liking for those things, meaning that they have, by heredity, certain dominant mental faculties and physical characteristics. The lines of one's face are the graphical representations of certain trains of thought which are habitual. The stooped shoulders, the peculiar gait, all bespeak the "natural and acquired" habits of mind and body. The pressure of conventionalized life forces certain similar habits upon all of us. It tends to make us, though different, act as though we were all alike. Soldiers, through drill, are reduced to units responding alike to orders, whatever the hereditary and acquired individuality or state of mind. Even fear can be eliminated from affecting a line of action, through habit. A man's usefulness to society is thus largely determined by his habits.

The result of habit is the conservation of nervous energy. If mental and physical actions did not, by recurrence, become automatic or reflex so that complicated movements follow a single stimulus, the simplest acts, as of dressing, would result in brain fatigue. Hence, it pays to learn how to do things right at first, in order that our nervous and physical systems may be relieved from needless work. A great man has said: "Continuity of training is the great means of making the nervous system act infallibly right." A bad habit once formed requires continual inhibitive action of the reflex centers, and for this reason is very difficult to break. "We do many things without thinking."

The most common cause of the failure of idle boys, such as the sons of the rich, is that they form the habits of receiving a luxurious living and do not form habits of paying their own way—automobile appetites, and not even a wheelbarrow earning capacity. One doesn't become strong by merely watching other people work. Many of these boys are hereditarily strong, but weak by reason of habits for which those who create the environment are wholly to blame. A large part of crime is due to the inability of the individual to continue the habit of satisfying certain wants; so he forges a check, steals, robs, and even murders.

A **trade** is a bundle of **physical** and **mental habits,** the result of years of painstaking and studied repetition, until not only the physical but the mental processes become absolutely automatic and sure.

A profession is a bundle of **mental** and physical habits, resulting from carefully directed and conscious effort in repetition, so that the mind eventually is able to solve the little problems without much expenditure of conscious mental effort.

A most important group of mental habits which should be expected from education, and especially from colleges, may be described as that **attitude of mind** which enables one to attack any problem without prejudice. Such habits may be acquired while working with broad minded teachers.

Inasmuch as one learns a thing by repeating it mentally and physically a sufficient number of times to form a **habit,** we are coming to see that each course in the schools or universities, etc., must have its corresponding laboratory or equivalent. History courses have their libraries; in economic courses and the like one may observe the actual conditions of life. The old idea that chemistry, physics, and engineering alone needed laboratories, is past.

It is well known that one loses his physical strength by lack of exercise, and that if too violent and long continued exercise is taken the same thing happens. It is the same in case of mental strength and of morals. We must use all of our faculties within reasonable limits, if we expect them to in-

crease in strength; so there is no escape from forming either good or bad habits, if we live.

It is evident that activity is necessary to life. In the interest of efficiency it is necessary that activity be along useful lines. True success comes to him who forms the habit of overcoming physical, mental, and moral obstacles as they are met. Success or failure, goodness and badness, strength and weakness, high efficiency and low efficiency, the man himself,—all depend upon habit. It is true that success depends upon opportunity but one must be ready for opportunity with a fine lot of habits.

The most important admonition that could be made to teachers, preachers, parents, and to all those having to do with the youth, would be: watch their actions and habits, provide such **spheres** of **stimuli** and **action** as will induce **wants** leading to those actions which result in good habits, and block by **discipline** the continued repetition of bad actions.

The "force of habit" is so strong that it is possible to hold evil hereditary tendencies dormant by cultivating good habits. If this could be accomplished in every case it would only be a question of generations when evil tendencies would largely disappear. Even most degenerates could be made useful if taken in time and kept in proper spheres of activity. Preachers know better than educators, that the inertia of habits may either carry one over difficulties or into difficulties. Moral habits result from **applying** the principles of religion and of ethics.

(*To be continued*)

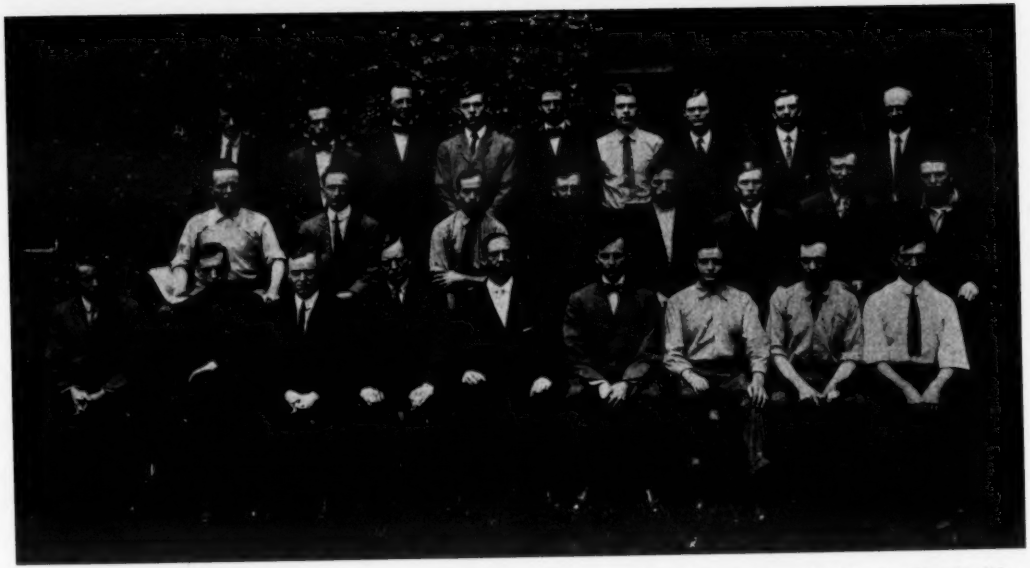
INSTRUCTOR'S COURSE AT THE WESTINGHOUSE WORKS.

BY G. B. THOMAS,

Professor of Electrical Engineering, Colorado College.

In the summer of 1911 it was found on investigation that eighteen college teachers of electrical engineering were working at the East Pittsburgh works of the Westinghouse Electric and Manufacturing Company. These men were called together for a discussion of the question of what could be done, in addition to the work with the company, to increase the value of the summer's stay. An account of the meetings which were planned and carried out was given in the BULLETIN for November, 1911. The article concluded with the statement that a similar scheme was under consideration for the summer vacation period of 1912. It was decided to carry out the plans and a circular letter outlining them was sent by the educational department of the company to the departments of mechanical and electrical engineering in the stronger technical schools of the country. As a result of this letter there were many applications and twenty-nine of those who applied were accepted, and remained with the company for the whole or a part of the summer. These twenty-nine men represented twenty-five technical schools and nineteen states. The accompanying picture shows them in their working clothes.

These men were placed in the various sections of the works in much the same manner as the college apprentices and, excepting those in the engineering offices and on test, were transferred from one section to another every two weeks. In this manner knowledge was gained of the conditions which the graduate meets when he enters a manufacturing company and information on shop methods, testing methods, the present



Back row. Read from left to right: A. T. Childs; H. D. Gruber; P. S. Emrick; R. F. Chamberlain; V. C. Pritchett; M. S. Mason; F. B. Davenport; R. L. Witham; F. T. Dargan.

Middle row. Read from left to right: E. J. Neary; W. A. Fogler; W. W. Perry; E. S. Foster; E. B. Stavely; R. M. Berry; F. A. Robbins; G. W. Grow.

Front row. Read from left to right: L. A. Doggett; C. T. Porter; W. D. Canan; A. P. Kitchen; G. B. Thomas; C. R. Dooley; Myron Creese; W. O. Godwin; L. W. W. Morrow.

type of machine manufactured, and such questions, was gathered.

It would be impossible to get into all the sections of the works during the summer, even with a transfer every two weeks, and it is very unlikely that one would get a comprehensive and inclusive idea even of the sections in which he had worked. Realizing this, inspection trips to, and talks on the various types of apparatus were planned.

The schedule shows the list of the inspections made and the men who conducted them. In all there were ten trips to the various sections of the electric company and one inspection trip to the Westinghouse Machine Company. One of the engineers from the section inspected was leader in the trips and he pointed out in the shop the apparatus in its various stages of manufacture, mentioning especially the newer changes in design and construction. These inspection trips were taken on Monday evenings after regular working hours so as not to interfere with the men at work and also to give a better opportunity for looking into the construction of the apparatus in detail without being disturbed.

On Tuesday mornings an hour and a half was scheduled for a talk and discussion on the apparatus inspected on Monday evening. These meetings were held during the "company's time" in the educational department rooms. As a rule the same engineer, who conducted the inspection trip on Monday evening, led this discussion. Usually there was a talk on the history of the development of the present type of apparatus and a discussion of the present engineering and commercial problems being worked out in the special field. After the talk there was an opportunity for questions and comments. The questions cleared up the points which were noticed during the inspection and as a result much valuable information was brought forth. There was no hesitancy in imparting the information which the company has been at so much time and expense to secure. From the schedule it will be seen that a broad field was covered.

On Thursday evenings, meetings were held at the Westing-

Schedule of Meetings.

Special Inspections.

Friday, August 16, 9:45 A.M. to 12:30 P.M.

Division 1. Inspection of physical and chemical laboratories, standard house and Section I.

Division 2. Inspection of lightning arresters, rectifiers, heating apparatus, switchboards, and circuit breakers.

Friday, August 23, 9:00 A.M. to 12:00 M.

Division 1 took the trip which Division 2 took on August 16, and vice versa.

Week Beginning	Monday, 5:30 to 7:00 P. M. Inspection of	Tuesday, 10:30 to 12 Noon. Discussion on Apparatus Inspected on Monday. Led by	Thursday, 8:00 to 9:30 P. M. At Westinghouse Club. Talk and Discussion.	
			Subject.	Led by
July 1.....	D. C. generators.	W. A. Dick.	July 4, no session.	
July 8.....	Turbo generators.	A. B. Field.	Dynamo Laboratory Methods.	E. M. Olin, E. I. Chute, C. A. Johnson, G. Goldman.
July 15.....	Rotary converters.	J. L. Yardley.	Shop School for College Graduates.	C. R. Dooley, Carl Coler.
July 22.....	D. C. industrial motors.	A. C. Lanier.	Engineering Curriculum.	F. T. Dargan, Chr., Chamberlain, Creese, Robbins, Childs.
July 29.....	Induction machines.	R. E. Hellmund.	Research.	C. E. Skinner.
August 5.....	Transformers.	H. C. Soule.	Value of the Apprentice Course for Commercial Training.	S. L. Nicholson.
August 12...	Railway locomotives and control.	L. M. Aspinwall, C. Renshaw.	Qualifications Desired by a Manufacturing Company.	B. G. Lamme, A. Taylor.
August 19...	A. C. generators.	R. A. McCarty.	Mathematical Analysis and Physical Interpretation.	B. G. Lamme.
August 26...		Inspection trip through Westinghouse Machine Co.	Coöperation.	C. F. Scott.

house Club on the broader subjects shown in the schedule. Besides the college teachers, there were a number of the Westinghouse men present at each meeting. The aim and purpose was to study the electrical-manufacturing field and get an idea of the qualifications of men needed in its various branches, to find the weaknesses of our present methods of teaching, by a study of the shortcoming of the graduates, and to confer on ways of improving the technical instruction. The officers, engineers and the commercial and shop management representatives all coöperated in making these meetings of value and from them were secured ideas on the subjects to be given and the method of presentation so as to best develop the technical college student to take his place in the industrial and civic life of our nation. The discussions were of added value as the teachers present came from such a number of technical schools and brought information on methods which had been actually tried and found successful.

Inspection trips were taken on Saturday afternoons and included the Aspinwall Filtration Plant, where the city of Pittsburgh filters its city water supply, the Carnegie Technical Schools, and the Pittsburgh Station of the Bureau of Mines where a special demonstration of the work was made for our benefit. Most of the large mills and machine shops were shut down on Saturday afternoons, so the men who wanted to visit these, secured passes through the Educational Department and took half days off to make the trips.

This is the first time so many electrical engineering teachers have been together for so long and the occasion was full of opportunities for the securing of information and the interchange of ideas on the teaching of electrical engineering. It ought to result in a marked improvement in the instructional methods of the schools represented. It is planned to have a course next summer which should be of even greater helpfulness because of the experience in getting together of these past two summers.

The men enrolled on the course and the institutions represented were:

R. M. Berry, Virginia Polytechnic Institute.
W. D. Canan, Pennsylvania State College.
R. F. Chamberlain, Cornell University.
A. T. Childs, University of Maine.
Myron Creese, Maryland Agricultural College.
F. T. Dargan, Clemson College.
F. B. Davenport, Georgia School of Technology.
L. A. Doggett, Harvard University.
S. P. Emrick, Purdue University.
W. A. Fogler, University of Pennsylvania.
E. S. Foster, Lehigh University.
W. N. Gladson, University of Arkansas.
G. W. Grow, University of West Virginia.
H. D. Gruber, Lehigh University.
W. W. Hill, Alabama Polytechnic Institute.
A. P. Kitchen, Massachusetts Institute of Technology.
L. W. W. Morrow, Cornell University.
M. S. Mason, University of Illinois.
E. S. Neary, University of Pennsylvania.
A. F. Nesbit, University of New Hampshire.
W. W. Perry, Lafayette College.
C. T. Porter, Sheffield Scientific School, Yale University.
V. C. Pritchett, North Carolina A. and M. College.
F. A. Robbins, Iowa State College.
E. B. Stavely, Columbia University.
G. B. Thomas, Colorado College.
R. L. Witham, Worcester Polytechnic Institute.
B. A. Wooten, Alabama Polytechnic Institute.

COLLEGE NEWS.

Pratt Institute.—The following appointments have been made to the faculty of the school of science and technology this fall: Walter J. Ammer, Lehigh University, 1907, instructor in machine design, to succeed Mr. J. H. Connolly, who has accepted a position with the Taft-Pierce Company of Woonsocket, R. I.; George E. Peaslee, 1905, instructor in applied electricity, to succeed Mr. S. R. Schealer, who has accepted a position in Lehigh University; George J. Cory, 1911, assistant instructor in forge and foundry, to succeed Mr. James N. Steele, who is now with the Jersey City Technical High School; Claude B. Gayton, a graduate of the tanning course, 1912, assistant instructor in tanning; Charles C. Schoen, 1912, as assistant instructor in machine work, to succeed Mr. Henry D. Burghardt, who is now teaching in the Jersey City Technical High School; Raymond A. Morrison, 1912, assistant instructor in chemistry.

Clemson Agricultural College.—W. C. Wagner, who joined the engineering staff as assistant professor of mechanical and electrical engineering last fall, has resigned to become chief engineer at Ft. Sill, Okla. F. T. Dargan was promoted to the position of professor of electrical engineering. Professor Dargan spent the summer with the Westinghouse Electric & Manufacturing Co., in their special course for teachers of electrical engineering.

The Pennsylvania State College.—The Engineering Experiment Station, under the direction of Professor J. A. Moyer, is conducting an investigation on smokeless combustion of soft coal in ordinary house heating systems. Another series of tests are being made for the purpose of studying and comparing Otto, or "gas" coke, and the ordinary "oven coke" with other fuels ordinarily used in heaters of the usual types, also giving attention to the most economical conditions of

operation. In connection with these tests, Professor Moyer will continue his investigations on the effect of painting on heat radiating surfaces.

Rhode Island State College.—The cornerstone of Science Hall was laid October 26, 1912. The building will house the departments of physics, chemistry, biology and bacteriology, botany and zoology. A new feature of the college work was started last year, called "Engineering Extension." This consists of lectures, by the various teachers, to engineering societies and also classes in instruction to men working in mills, power plants, etc.

Washington University (St. Louis).—Registration in the department of arts and sciences, including the college and the schools of engineering and architecture, shows a considerable gain over that of last year, being 28 per cent. in the college, and 10 per cent. in the schools of engineering and architecture. Thirty-one per cent. of the freshman class are non-resident, or about 10 per cent. more than in the past.—On November 9 the Engineers' Club of St. Louis arranged a trip to inspect the hydro-electric development at Keokuk, Ia. The party included 72 members, among them 12 senior students of the school of engineering.

University of Kansas.—Mr. Grandville R. Jones, for several years in charge of the filtration plant in Washington, D. C., has been engaged as professor of sanitary engineering for the State Board of Health. Professor Jones began his work in September, succeeding Professor W. C. Hoad, who has gone to the University of Michigan. An assistant, Mr. C. A. Haskins, also devotes his entire time to this work, which is an important part of the state service rendered by the university. Professor R. B. H. Begg begins his work at the university this year as professor of sanitary and hydraulic engineering, coming from the Pennsylvania Military College at Chester, where he was head of the civil engineering department. Professor F. H. Sibley, for several years head of the department of mechanical engineering at the University of Alabama, has taken the position in the mechanical engineering department, to suc-

ceed Associate Professor C. I. Corp who has gone to the University of Wisconsin. Mr. John D. Garver comes to the engineering faculty as instructor in mechanical engineering. Mr. Garver has been chief draughtsman in the schedule writing department of the Santa Fe railway shop system.

University of Minnesota.—The Minnesota chapter of Sigma Xi is arranging a series of scientific meetings which promises to be of great interest and profit. Another series of popular, evening lectures is being given by various professors of the university. The two already given have been by Dr. Burt Newkirk and Professor Francis P. Leavenworth.—Several additions to the teaching staff of the College of Engineering were made at the beginning of the present semester. Among them are: Raymond W. Brink, instructor in mathematics and mechanics, formerly instructor in mathematics at the University of Idaho; Louis L. Thurstone, Cornell 1912, instructor in drawing; Lewis B. Walton, instructor in architecture, who is a graduate of Pennsylvania State College. The course in architecture, which was suspended last year, because of the death of Instructor Trott, is now resumed under the direction of Mr. Walton.—The grounds of the College of Engineering are being beautifully graded and terraced about its new buildings, requiring the removal of about 10,000 cubic yards of earth.

The University of Nebraska.—Oscar Van Pelt Stout, 1888, the senior professor of the Engineering College, has been appointed dean. For three years instructor, Dean Stout has since 1894 been the head of the department. He is a charter member of S. P. E. E., a member of Sigma Xi and also of Phi Beta Kappa.—George H. Morse, S. P. E. E., has resigned the professorship of electrical engineering and is now with the Western Cement Construction Company. His position has been filled by the election of Olin J. Ferguson, 1903, who comes from the faculty of Union College, where he was active assistant to Dr. C. P. Steinmetz. He is a member of S. P. E. E., Am. Inst. E. E., N. E. L. Assn., and Sigma Xi. Mr. Ferguson is the author of a textbook on "Electrical Trans-

mission." The position of assistant professor of mechanical engineering, made vacant by the resignation of Lynn A. Scipio, S. P. E. E., who has accepted the headship of the department of engineering of Robert College, Constantinople, Turkey, has been filled by the appointment of B. F. Raber, of Purdue. Professor Raber was closely associated with Professor Hoffman in the authorship of his "Handbook for Heating and Ventilating Engineers." Mr. E. B. Kingsland, Ph.B., University of Vermont, and C. E., University of Maine, has been appointed instructor of civil engineering. Mr. Kingsland has had about eight years' substantial engineering experience on the Panama canal and on railroad work. L. F. Seaton, 1911, has been appointed instructor in agricultural engineering. Before and after graduation he devoted much time to farm management and to expert work with threshing machinery, engines, etc.—The department of applied mechanics has opened a new laboratory for testing road materials. About $1,400 has been expended in apparatus and it is especially equipped for making all necessary tests.

Purdue University.—The university opened in the fall with an attendance slightly greater than that of last year.—Several changes are reported in the engineering staff: In civil engineering, Professor G. W. Case has returned from a year's leave spent at Cornell University. Messrs. E. S. McCandliss and M. O. Fuller have resigned, the former to become instructor at the University of Missouri and the latter at Lehigh University. In mechanical engineering, Professor L. V. Ludy has returned from a year's leave of absence at the University of Wisconsin where he substituted for Professor C. C. Thomas in the department of steam engineering. Mr. B. F. Raber has left to take a position at the University of Nebraska, being succeeded by Professor J. S. Staudt, a graduate of Franklin and Marshall College, who comes from the Automobile Manufacturing Company of Racine. A. A. Neff has left the department of machine design and is now at Loyola College, Chicago. Mr. C. A. Johnson has resigned to go into consulting work. Mr. C. S. Johnson has gone to the Colorado School

of Mines. Mr. O. C. Klipsch has resigned on account of ill health and is now in Arizona. Mr. J. H. V. Finney, formerly assistant in the engineering laboratory, is now at the Colorado State College. His place is being filled by Mr. R. W. Noland, 1910. Mr. G. C. King, 1901, comes from a position as general manager of the Union Irrigation Company of Louisiana to the department of machine design. Messrs. A. G. Waidelich and A. W. Day are taking the places of Messrs. H. S. Busey and D. T. Couron, who have resigned. Mr. H. L. Watson has been transferred to the department of mechanical engineering, his place being filled by Mr. G. R. Harr. Mr. J. A. Vancourt resigned to accept a position as teacher of manual training in Leavenworth, Kansas. His place is filled by Mr. J. L. Wunderlee.—The principal addition to the equipment during the part year has been a machine for testing flat wheels, for which the various railroads composing the New York Central Lines were instrumental in securing funds.

SECTION II.

PAPER FORMING A PART OF THE PROCEEDINGS OF THE SOCIETY.

STAFF SUPERVISION IN A TECHNICAL SCHOOL.

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There is a traditional objection among the teachers of colleges and universities to the exercise of any considerable degree of control over the methods and work of the individual members of their faculties. One hears much of "academic freedom," and however broadly that term was formerly applied, the modern professor not infrequently insists that it signifies a condition which makes him the sole judge of his own conduct. Under the protection of academic freedom, as thus defined, the professor may rise in the morning if he feels like it, may meet his classes if he feels like it, and if he meets them, he may give them such instruction as he may wish to impart. His individual judgment controls in such matters, and consequently whatever he may do is justified. This view undoubtedly represents a very superficial conception of the real significance of a term which stands for a great principle in university life and administration, but it is one which is frequently put forward as a defense for a procedure which is unsystematic and disorderly.

Without attempting to discuss the considerations which underlie this view of academic freedom, I would make it clear that whatever may be the ideals in university administration, those of the technical school must provide for a reasonable concession to certain fixed rules. The technical school, which has for its purpose the training of men in the art of doing things, must conduct its affairs by a procedure which is so orderly as to be commonly understood and respected. As in the administration of business, there must be some one who knows what each man is doing and who can insist that assigned duties be carried out with as much precision as possible.

There must be supervision which is individual and supervision which is general. By supervision, the degree of success achieved by each man must be determined, and by it, influences must be exerted which will operate in a multitude of ways to increase efficiency.

Obviously, no one man can perform a supervising function which may assume so diversified a form. It is quite impossible for a dean or director to know each man making up his organization with a degree of intimacy which will permit him to be a safe adviser of the subordinate's most immediate personal needs; neither can he in all cases know in detail the field of scientific endeavor in which the subordinate is or ought to be working. Supervision can not, therefore, be effectively exercised by any one individual; it implies an organization. The fact that college organizations have in some cases operated unfairly to restrain the individual, and by so doing have hindered rather than helped the development of a true scientific spirit in individuals, does not in any way impair the value of my statement.

The staff organization of a technical school should not act as a taskmaster nor as a restrainer of individuals; its main purpose should be to provide responsible leadership. Such an organization should be so definite that no young man in it would for a moment be in doubt as to who is his superior, and under ideal conditions he should make his superior his mentor. Under ideal conditions, also, the superior should have no doubt as to who among the younger members are responsible to him, and he should study assiduously their interests, their personality, and their needs. He should seek diligently to encourage them in their efforts to become masters of themselves and of their science, and he should encourage them in their efforts to secure a broad understanding of related sciences. The strength of the supervising element in a technical school will depend upon the thoroughness with which these ideals are realized.

The most important function in supervision is that by which the young instructor comes to an appreciation of the signifi-

cance of his relationship with students. Here again tradition is not especially favorable to the development of high efficiency, for by tradition it is the part of the professor to prepare for the intellectual feast, and of the student to partake of that which is placed before him or to go away unfed. Under such treatment the weak student goes away unsatisfied, the indifferent finds nothing to stimulate his interest or fancy, only the strongest can survive, and as a consequence the whole process becomes one in which the idea of selection predominates. If it is the function of the young college instructor to determine who among the rising generation are most worthy to receive an education, the process is justifiable, but even under this interpretation it is one of low efficiency. One of the tendencies of such a practice is to fix a great gulf between the professor and his student. There is no hand and shoulder contact; it is a play with foils. From the student's point of view, the whole process becomes a great and serious game, which if it grows exciting resolves itself into a contest, the rules of which are not very definitely defined. Happily, this traditional relation between instructor and student is not that which in any large measure controls our great institutions of today, but there is no institution of any considerable size, however well organized or however carefully administered, in which there does not exist either a fragment or a good-sized remnant of the traditional ideal.

In striking contrast with all this, stands the man whose chief desire is to serve. If through the suggestion and advice of an immediate superior there can be developed in the instructor a desire to be of real service, even to the least attractive of his students, a beginning will have been made. If the young instructor can be taught in methods which, when applied, will convince his students that there is no element of antagonism between them, that he is always for his students and intensely interested in their welfare, he will find himself well on the road to achievement of high efficiency in the administration of his duties. If as a result of such relations the unsuccessful student will admit that he failed, instead of insisting that " his

instructor failed him," the instructor will have gone far toward establishing himself as a successful and efficient teacher.

The importance of the supervising function is emphasized by the fact that the art of the teacher is not a simple one. Many who seek proficiency in it fail completely through temperamental or intellectual deficiencies, and even the most successful are in need of encouragement and help; consequently, behind each instructor, from the most humble up to the head of the department, there must be some one who will have an accurate knowledge of the work which should be done, who will be ready to commend when successes are achieved, to aid where mistakes are to be overcome, to act vigorously where promotions are due, and who will insist upon the elimination of men who show themselves incapable of improvement. These propositions are all extremely elementary. The necessity for an organization which will provide for the discharge of such functions in supervision would hardly seem to be debatable; and yet with all that has been accomplished in the last quarter of a century in the development of technical education, the fact remains that we have done little to prepare for the discharge of these functions. The result is that most of our technical schools are today deficient in the all-important element of leadership. We have the framework, but there remains the difficult problem of filling in the frame. The need is for more men who always ring true; who as technicians, scientists and teachers are so well qualified for the supervisory function as to be capable of raising the work of the technical schools to a standard of efficiency which is commensurate with the present-day needs and with the dignity of the engineering profession.